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THE STUDY OF MINERALOGY FOR SELF CULTURE.

By J. C. COOPER, Topeka.

THE opening lines of Bryant's poem "Thanatopsis" invite to the study of nature in these beautiful and impressive words:

> "To him who, in the love of Nature, holds
> Communion with her visible forms, she speaks
> A various language: for her gayer hours
> She has a voice of gladness, and a smile
> And eloquence of beauty; and she glides
> Into his darker musings with a mild
> And gentle sympathy, that steals away
> Their sharpness ere he is aware."

The purpose of the writer at this time is to say something additional, in a general way, to encourage the study of nature, and later on to call attention more particularly to the inviting field of mineralogy.

There is no more instructive, delightful and useful recreation for man than the study of some branch of natural science. As the young student becomes acquainted with nature's works, their beauty and usefulness and perfect conformity to law, they teach him the most useful lesson youth or manhood can learn, that throughout the wonderful and complicated machinery of nature's works there runs everywhere the binding thread of law and obedience, holding every atom of matter in wise and loving subjection to its will. And man, being composed of atoms of matter, must obey these laws, so far as they concern him individually, as positively as inert atoms, or he will inevitably suffer the consequences. A violation of nature's law cannot be condoned by the purchase of indulgence. It must be worked out with repentance.

All of us, when in a crowd, probably have been impressed with the variety of faces that pass before us. No two of them are alike, and it is quite probable that in the whole human family there are no two persons exactly alike. This gives us a little idea of the variety in nature. As these faces differ, we may reasonably assume that each individual will differ in his internal laboratory and his mental and spiritual wants. Yet, with all this difference, the field of nature is varied enough to furnish delightful, instructive and useful employment and recreation for all, if one gets into the line of work he is qualified and adapted for.

Emerson says: "The crowing fortune of a man is to be born to some pursuit which furnishes him employment and happiness, whether it be to make baskets, or broadswords, or canals, or statues, or songs."

One can conceive of the delight in a pursuit that furnishes employment and happiness. But through the incongruities of life, resulting from ignorance of and departure from law, very few are so fortunate as to enjoy that happy combination. The careful study of nature's works, constantly impressing us with the perfection and inviolability of her laws, will help us to approach that enviable condition.

The diversity of human wants is illustrated in the field of natural history study by the direction that the individual tastes and inclinations lead. Some develop a natural inclination for a particular field of study, and if they are rightly started in it they are among the fortunate few whom Emerson had in mind. The study becomes a love with them; a love that sweetens labor and duty.

The three broad fields of nature's works, animal, vegetable, and mineral, are subdivisible into numerous branches. A better acquaintance with any one subject discloses a wide field, again subdivided into specialties. Those who give the subject most thought and study, in any direction, find that greater excellence can be obtained by concentration upon a small field of work.

Application and industry educate the eye as well as the hand. The enthusiastic entomologist will catch the glint of a beetle's flight across his path when thousands of people would not see anything.

The writer, at one time, was showing some pretty minerals to a country friend who had his son with him, a stout boy of nineteen years of age. The boy asked, with astonishment, "Where did you get those things?" He was told that these had been picked up in rambles over the country, when he exclaimed, "I never see anything like them." And he did not—and comparatively few people do. Excellence acknowledges no guaranty but labor, and it takes the trained eye to catch the flight of a beetle, or the form of a fossil, or a crystal in the rock. Even the hues of the earth and the blue of the sky have no beauty for some people. The eyes might transfer to their soul the granduer of what they could take in in a sweep, but they don't. In fact, we might almost believe we were daily among men who

"Could strip, for all the prospect yields
To them, their verdure from the fields;
And take the radiance from the clouds
With which the sun his setting shrouds."

Mineralogy more intimately concerns the human family than any other branch of natural science. All the elements that enter into the composition of matter are mineral. Our bodies, the earth we live on, the air we breathe, the water we drink, the food we eat, all the articles of use that minister to our necessities and comforts, all the articles of ornament that adorn the homes of luxury, all the colors of paint upon the artist's palette, the bloom on beauty's cheek, and the flowers—"those reminisences of Eden and prophecies of heaven—the splendid children of the sun and the jewelry of the soil," are all made up of and are resolvable into mineral elements.

Nature invites to this study by adorning the material with the beauties of all the gems. She fashions from the most common materials her most beautiful and precious gems. From carbon, an abundant and common mineral, which, as coal and charcoal, contributes so much to our necessities and comforts, by an art that man has not yet been able to imitate profitably, she fashions the diamond.

From the abundant element, aluminum, which makes up, probably, one-tenth of the entire earth, combined with oxygen, another common element which makes up about one-half of the earth, she makes the sapphire, the oriental or true ruby, the oriental emerald, the oriental topaz, and the oriental amethyst. These, when found perfectly crystallized, and composed of pure oxide of aluminum, with a little coloring matter from some mineral oxide, are among the most valuable gems known. The pure aluminum ruby, when of perfect color, is more valuable than the diamond. Nearly all the favorite gems, next in degree of value to the diamond, and the pure oxide of aluminum, are varying oxides of aluminum, silicon, and iron, with occasional oxides of a few other metals.

It is exceedingly interesting to study this feature of nature's work—how she makes her most beautiful gems out of the most abundant and common mineral. Like, in our republican form of government, where the human elements have free opportunity to develop, we bring forth our Lincolns, Garfields, Grants, and nearly all the leading minds in commerce, in the industries, in art and literature, from the common material of society. There is hardly a distinguished man in this country to-day who has not, in this, or only a few generations back, come up from the common people.

The sentiment of mineralogy is abundant and beautiful; but it will be more interesting to practical minds that are anxiously concerned about their daily needs to consider, more particularly, the practical uses to which this study can be applied.

There seems to be a wise forethought and lawful purpose in all of nature's work. She has crystallized all the common and many of the rare minerals into beautiful forms and adorned them with attractive colors, and many of them with a luster of finish that rivals the lapidary's art, evidently to attract our attention and get us interested in them. An acquaintance with their beauties of form and color naturally leads us to want to know something of their composition and useful properties, and this want invites to the study of the chemistry of mineralogy, which opens up more of the useful secrets of nature's work, for man's necessities, health, and comfort, than any other department of natural science.

The field of the practical uses to which mineral atoms can be applied is so broad, it so intimately concerns all our material wants, that it furnishes infinite employment for human pursuit. The mining and fabrication into useful and ornamental forms and compositions of all the metals—of gold, silver, iron, aluminum, zinc, lead—the varieties of useful rocks, the alkalies and clays, give employment to the most varied talents. A little reflection will impress the student with the useful fields this study opens.

All the elements made known by chemistry are found in minerals, for the mineral kingdom is the source of whatever living beings—plants and animals—contain or use.

"The chemist cannot make anything; he only supplies the favorable conditions for the action of the laws that absolutely govern every atom of matter."

Having shown that mineralogy deals with all the elements that make up this earth and all that there is on it, and, in all probability, all matter of every kind throughout space, its usefulness cannot be questioned.

The writer has been surprised at the lack of interest manifested in this particular department of natural science in our collegiate institutions. Fossil geology, or paleontology, seems most to interest them. Perhaps they have become so accustomed to devote study to dead languages and dead things that they do not appreciate the vitality of the living present and the prospective activity of the coming future.

The writer's attention was particularly attracted recently, upon the receipt of a circular from the University of Chicago, to a list of professors under the head of "department of geology." This list enumerated seven different subdivisions of this department, with a special professor at the head of each. These subdivisions were: "Head professor of geology," "professor of geographic geology," "professor of petrology," "professor of economic geology," "professor of pre-Cambrian geology," "professor of paleontological geology," and "professor of archeologic geology," but not a single professor of mineralogy.

Some time ago when in Chicago, the writer visited that great institution, which already has cost many millions of dollars, and inquired for their mineral collection, and was informed that they did not have any. It was suggested that such an institution should have a good collection of minerals to assist in their educational work. They gave as the reason for not having any minerals that they did not have money to spend for them, although they were about to invest a good many thousands of dollars for some bones of gigantic fossil animals of the Carboniferous period which had been discovered in Utah.

I felt a good deal like saying that we were not living in the Carboniferous age now, and that something pertaining to the present day and its practical work might prove a great deal more useful.

Mineralogy is preeminently a practical science. It is in direct contact and intimately associated with the activities of to-day. It holds in its wide domain more of interest to the future of humanity than any other branch of natural science.

Microscopic mineralogy is a very pleasing and attractive branch of the study. Nature has, in a measure, concealed many of the most exquisite beauties of her work in such minute forms that it requires the most powerful microscope to develop their beauties. One great advantage of this branch of the study is in the small space required for a collection. Many have been deterred from collecting minerals because the material is so bulky, and requires a great deal of space to exhibit it to advantage. This objection is done away with in microscopic mineralogy. The writer has a friend and correspondent in Philadelphia, a gentleman of wealth and excellent taste, who devotes his whole attention to microscopic work. It is a great pleasure to look over his collection, which pretty well covers the field of amateur mineralogical study. It was contained in a few small cabinets, or boxes of drawers, each about one foot square, which could be picked up like a satchel and carried about anywhere. He had a small room which he called his "den," about twelve feet square, a round table about three feet in diameter, the top of which revolved freely. We sat on one side of this table, with my friend opposite. He would take out one of his mounted specimens, which did not occupy more than a square inch of space, and, placing it under the large binocular microscope and adjusting the focus, would turn the top of the table around so that the microscope with its object would come in front of myself for observation. In that little room we spent a delightful evening looking at the beauties of the mineral kingdom, exhibiting the most perfect crystallization, and gorgeously beautiful in color. Crystals so minute that they could not be seen by the naked eye appeared under the microscope as large as sections of a lead-pencil. It was a great pleasure to discover that quite a number of his most beautiful and rare gems were some that the writer had picked up on old dump piles in New Mexico and Arizona and had sent to him.

The microscope discloses the fact that a great deal of nature's most perfect and beautiful work in the mineral kingdom is in minute forms. Large minerals require the natural and best light of day to bring out their beauties, but these little gems under the microscope can be seen to advantage and studied by artificial light.

Something should be said to encourage the youth—the boys and girls—to become interested in this study. It does not cost much to get a few interesting specimens of minerals for them and some rudimentary works on minerals. A little later a microscope will open a new world of beauties to them. Then the determination of them will give them endless employment and happiness. It will bring them only good, and keep them from a great deal that might be harmful. It is healthful, physically and morally, instructive and entertaining.

It makes a very attractive and interesting study and recreation for women. There is nothing so attractive to an esthetic taste as the gems of the mineral kingdom. One cannot conceive of a more delightful recreation for a cultured woman than to gather these gems and study their varied forms and beauties. By gems is not meant, what a good many would suppose, the costly gems, but the gems of the mineral kingdom—small, unique and good crystallizations of the minerals. The gathering of these is not confined to the minerals that are found in the neighborhood. They can be obtained at moderately reasonable prices from houses that deal in minerals and by exchange with collectors in other localities. When a collector finds himself or herself in possession of a number of duplicates of any mineral, by the possession of a copy of the Naturalists' Directory, a book that is published giving the name and address of all known collectors, with their specialties, he can select persons to correspond with who are interested in the same line of work, and learning what his correspondents have to exchange, he can work up a profitable and pleasant exchange, thereby getting acquainted with many pleasant correspondents, and adding to his knowledge of minerals and to the enlargement and variety of his own collection.

To the aged and those pretty well advanced in life, who have given some study to this subject, the collection of minerals furnishes an endless and interesting source of recreation and instruction. When disappointments and cares oppress them their minerals will always meet them with a friendly countenance and an amiable disposition. They are always teaching something, and they do it so kindly and so thoroughly that they prove most agreeable companions.

No matter how one may feel depressed by human ingratitude and want of sympathy, when one turns to his minerals for companionship and friendly counsel they will not be a source of disappointment. They will disperse the demons of despondency and unrest, and open up fields of study in God's works that so beautifully illustrate the perfect laws of wisdom and love with which the Great Master rules His universe, so that hatred, sadness and disappointments will leave the mind, and a cheerful spirit will take their place and give renewed courage and hope.

The field of this inviting study is illimitable, and the worlds to conquer are always waiting for industrious and enthusiastic effort.